Original Article

A survey on orthodontic services provided by general dental practitioners

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Abstract

The aim of this survey-based study was to recognize professional determinants that account for variations in the level of orthodontic services provided and which distinguish providers and nonproviders of orthodontic services. Multiple regression analysis revealed that four practitioner characteristics explained 43% of the variance in the number of orthodontic patients treated. Dentists who treated more orthodontic patients (1) treated more general practice patients, (2) frequently used multiple sources to keep up to date in orthodontics, (3) perceived their patient base to contain more children, and (4) were likely to have attended an orthodontic course. The null hypothesis that selected characteristics of dentists providing orthodontic services were no different from those of dentists not providing orthodontic services was rejected. The provision of orthodontic services was associated with a higher level of continuing orthodontic education and treating more general practice patients, especially children.

Keywords: General dental practitioners, orthodontic services, survey

Introduction

Patient characteristics and the personal and practice characteristics of dentists have been hypothesized to influence the delivery of orthodontic services.[1] Brown identified a number of practitioner characteristics that accounted for variations in the level of periodontal services provided in the general dental practice. A number of overseas studies have established that certain practitioner characteristics may differentiate providers from minimal or nonproviders of orthodontic service.[1-12] However, Taylor and Kerr[13] found that a number of these practitioner characteristics, that is, number of years since graduation, dentists' perception of their undergraduate training, and attendance at an orthodontic continuing education course, did not influence orthodontic service provision. Having identified variations among general dental practitioners in the level of orthodontic service provision, this study aimed to identify practitioner characteristics that account for variations in the level of orthodontic services provided and which distinguish providers and nonproviders of orthodontic services.[14] The null hypothesis was that selected characteristics of dentists providing orthodontic services were no different from those of dentists not providing orthodontic services.

Materials and Methods

Four groups of general dental practitioner characteristics were hypothesized to be associated with variations in the provision of orthodontic services.

1. Personal and practice characteristics, which include (a) sociodemographic characteristics, (b) undergraduate

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education characteristics, (c) continuing education characteristics, and (d) general practice characteristics.
2. Dentists' attitudes toward orthodontics. Three areas were investigated: (a) dentists' attitude toward continuing education in orthodontics, (b) dentists' attitude toward the provision of orthodontic services, and (c) dentists' satisfaction with the level of orthodontic services they were providing.
3. Dentists' knowledge of orthodontics (19 questions were used to form a knowledge scale).
4. Dentists' practice characteristics (information for this section was obtained from the procedure log; 100 dentists provided information in the procedure log). The 100 respondents for whom log data were available were divided into two groups, based on the number of orthodontic patients seen over the period (not including those referred for treatment). Those who provided orthodontic services saw three or more orthodontic patients during the fortnight of the log, while the "nonprovider group" included those who saw either no orthodontic patients or only one or two orthodontic patients during the fortnight. It was predicted that there would be significant differences between these two groups with respect to demographic and educational characteristics. Even though more dentists were represented in the "nonprovider group" (64.5%) than in the "provider group" (35.5%), this division of the sample produced two samples of adequate size for analysis. The point of division was based on the assumption that this would more accurately separate providers from nonproviders of orthodontic services in this sample, even though the nonprovider group contained dentists who were minimal providers of orthodontic services. Since the log was taken over a period of 2 weeks whereas orthodontic patients are generally seen every 4 weeks, some of the dentists who did not see any orthodontic patients may have seen one or two if the log had been completed at a different time of the month. Statistical analysis, nonetheless, produced similar results when the sample was divided between dentists providing no orthodontic services and those providing some orthodontic services. The SPSS program 18 was used to analyze the data. Chi-square, correlations, and Student's *t*-tests were used to limit the number of variables collected that were subsequently used in multivariate analysis – multiple regression and discriminant analysis. The variables selected for the multivariate analyses were a number of those where the probability level was less than 0.05 when the variables were compared between the provider and nonprovider.

Review of literature

Orthodontic treatment provided by general dentists has been reported in the literature, but the results are conflicting. While Hilgers *et al.*[15] found that pediatric dentists spent less than 10% of their time providing orthodontic treatment and Galbreath *et al.*[16] similarly noted that general dentists spent less than 10% of their time providing orthodontic treatment, a study by Koroluk *et al.*[17] showed that a large percentage of pediatric and general dentistry practitioners provided comprehensive orthodontic treatment (62% and 17.9%, respectively). In another study, 76.3% of general practitioners were found to provide basic orthodontic treatment and 19.3% provided comprehensive orthodontic treatment.[18] General practitioners who showed a profile of high-volume orthodontic services were found to treat more difficult cases and there was a projected increase in the amount of orthodontic treatment performed in general practice.[19] Thus, the anticipated increase or decrease in orthodontic treatment in general practice is debatable and has been discussed in most of the previously mentioned articles.

General dentistry practitioners usually decide whether, when, and where to refer the patient. They are considered to be gatekeepers for specialist dental care.[20] If referrals are made before the patient is ready for treatment, this may result in unnecessary appointments. However, if referrals are made after the "ideal" time, the treatment may be more complex and lengthy. A study in England revealed that one reason for an excessive length in the waiting list of new orthodontic patient consultation is the unnecessary referral of patients by general practitioners.[21] In a study by Parfitt and Rock who surveyed 30 general practitioners for their treatment plan accuracy and referral pattern, only 14% of general practitioner treatment plans agreed with the gold standard.[22] According to Berk *et al.*, when the treatment need assessment scores of orthodontists, general dental practitioners, and pediatric dentists are compared, it was found that all three groups exhibited high levels of agreement on orthodontic treatment needs.[23]

Dental students in the United States were surveyed to determine their ability to recognize malocclusions and measure their diagnostic skills. The study concluded that 4 years of undergraduate education did not improve the students' orthodontic diagnostic skills.[24] Among the British dental schools that were studied, 75% did not expect their new graduates to be able to formulate an orthodontic treatment plan. They also believed that undergraduate training should be concentrated more on the diagnosis and recognition of a dental malocclusion, rather than on the formulation of a treatment plan.[25]

A survey of orthodontists suggested that early orthodontic intervention is the norm among practitioners in the United States, but practice characteristics affected treatment timing.[26] Another survey showed that a majority of orthodontists recommended that the first assessment of an occlusion should be carried out before the age of 7 years and that cross bites should be preferably applied during primary- and early-mixed dentition stages.[27] In West Sussex, while 52% of dentists were able to correctly identify which type of orthodontic provider they refer to, only 20% of them were able to determine the appropriate time of orthodontic referral.[28] Carty *et al.*[29] assessed the performance of the referral management system compared to a previous paper-based referral system and to determine whether referrals reflected the patients' malocclusion and met current guidelines.

Results

Table 1 summarizes the practitioner characteristics investigated and the level of statistical significance reached when these variables were compared between the provider and nonprovider groups. Nineteen variables, including dummy variables, were initially used in the multivariate analyses of the results. The ordinary least square regression analysis found that only four variables were significant in explaining variations in the number of orthodontic patients seen by the general dental practitioners during the fortnight of the log, that is, the dependent variables. The adjusted R^2 for this regression was 0.43, indicating that the combination of these independent variables explained 43% of the variance in the dependent variable. Variables that were found to be significant in the discriminant analysis showed that the provision of orthodontic services was associated with the following:

(1) Higher number of general practice patients seen
(2) Higher perceived number of children in the dentists'
(3) Higher frequency of use of sources to keep up to
(4) Working in the outer rather than the inner suburbs
(5) Not working for the government
(6) Not working in the city
(7) Better attitude toward the provision of orthodontic
(8) Orthodontics not being a regular part of the under-
(9) Not wanting to treat fewer orthodontic cases
(10) Higher perceived orthodontic need of the dentists'
(11) Higher referral level to specialist orthodontists.

The null hypothesis that selected characteristics of dentists providing orthodontic services were no different practice date in orthodontics services graduate course patient base from those of dentists not providing orthodontic services was rejected by both multivariate analyses at a significance level of $P < 0.01$.

Table 1: Practitioner determinants that were investigated and the level of significance obtained when comparing these variables between the provider and nonprovider groups

Practitioner characteristics	Level of significance
1. Personal and practice characteristics	
a. Sociodemographic characteristics	
Gender	NS
Age	NS
b. Undergraduate education characteristics	
Year of graduation	NS
University of graduation	NS
Undergraduate orthodontic training	NS
c. Continuing education characteristics	
Number of continuing orthodontic education courses attended	*P*<0.01
Scale assessing frequency of use of other sources used to keep up to date in orthodontics	*P*<0.01
d. General practice characteristics	
Practice situation, i.e., solo practitioner, group practice, etc.	*P*<0.01
Practice area, i.e. city, inner suburbs, outer suburbs, etc.	*P*<0.01
Number of years in general dental practice	
Dentists' perceived age profile of their patient base	NS
Dentists' perceived orthodontic need of their patient base	*P*<0.01
2. Dentists' attitudes toward orthodontics dentists' attitude toward continuing education in orthodontics	*P*<0.05
Dentists' attitude toward the provision of orthodontic services	*P*<0.01
Dentists' satisfaction with the amount of orthodontic services currently provided	*P*<0.01
Dentists' satisfaction with the difficulty of the malocclusions currently treated	*P*<0.01
3. Dentists knowledge of orthodontics	*P*<0.01
4. Dentists' practice characteristics	
Number of general practice patients seen	
Number of hours worked in general practice	*P*<0.01
Number of patients referred for specialist orthodontic treatment	*P*<0.01
	P<0.01
	NS

Discussion

Limitations of the study

(1) Numerous variables were collected from the questionnaire; however, due to the sample size, not all could be used in the multivariate analyses of the results. Student's *t*-tests, Chi-square, and correlation were used to limit the number of variables; however, in doing so, variables that may have been significant in the multivariate analyses may have been missed.
(2) The reliability of the procedure log and questions developed for use in this study had not been previously tested, and comparison of some of the variables measured with other studies was impossible.
(3) The orthodontic procedure log ran for only 2 weeks, whereas orthodontic patients are generally seen monthly. Consequently, dentists may have been grouped differently, that is, into provider or nonprovider groups, if the log had continued for 1 month.

Dentists' professional characteristics

The mean age of dentists in this study was 40 years. Although it has been found that females work, on average, fewer hours per year than males, and this study found that the provision of orthodontic services was associated with the number of hours worked, there was no statistical difference between the orthodontic service provision of male and female dentists. Discriminant analysis suggested that orthodontics not being part of the undergraduate dental course was significantly correlated with the provision of orthodontic services. Approximately 36% of the dentists surveyed had attended a continuing education course in orthodontics. Freer and Foster[30] reported that 12.6% of their sample had attended an orthodontic refresher course in the past 5 years.

Gorczyca *et al.*[3] and Jacobs *et al.*[5] found that the number of orthodontic procedures provided increased with the number of hours of orthodontic continuing education attended. A similar relationship was found in this study, where dentists in the provider

group appeared more likely to have attended a continuing education course in orthodontics and to have attended more courses than dentists in the nonprovider group. A variety of materials can be used to keep up to date in orthodontics, for example, journals and textbooks. The scale measuring dentists' involvement in keeping up to date in orthodontics explained 17% of the variance in the number of orthodontic patients seen in general dental practice. The majority of dentists surveyed were in private practice. About 46% of the dentists surveyed were in solo practice. Working for the government was the only practice situation variable associated with the provision of significantly fewer orthodontic services than in solo practices. An increased number of children in the dentists' patient base was associated with the provision of orthodontic services. This relates well to the log data, where the majority of patients seen for orthodontic services were between 10 and 14 years of age. An increased perceived need for orthodontic treatment in the dentist's patient base was also associated with the provision of orthodontic services.

Dentists' attitude and knowledge related to orthodontics

The scale measuring dentist's attitude toward continuing education in orthodontics was significantly different between the provider and nonprovider groups; dentists in the provider group had a better attitude toward continuing education. However, this variable was not significant in influencing the provision of orthodontic services or discriminating between providers and nonproviders, in the multivariate analyses. The scale assessing dentists' attitude to the provision of orthodontic services was found to be significant in discriminating a dentist who was a provider of orthodontic services from one who was not, suggesting that a better attitude to the provision of orthodontic services was associated with the provision of orthodontic services.

General dental practitioners' interest in orthodontics has been found to be associated with the provision[10] and expanding provision[3] of orthodontic services. One of the questions in the attitude to orthodontic service provision scale asked the practitioner to indicate whether or not they found providing orthodontic services interesting. Approximately 80% of the dentists surveyed stated that they found orthodontic service provision interesting. Assessment of dentists' satisfaction with the level of orthodontic services they were providing revealed that a minority of dentists wanted to treat fewer malocclusions or less difficult malocclusions. This was similar to the finding of Jacobs *et al.*[5] where less than 4% of the dentists surveyed wanted to "do less" orthodontics. Approximately 40% of the sample in this study would have liked to treat more orthodontic cases. Not wanting to treat fewer orthodontic cases was found to be associated with the provision of orthodontic services. This shows that dentists who were orthodontic providers wanted to maintain their current level of service provision or increase it. This increase may also be associated with the treatment of more difficult malocclusions, since less than 10% of orthodontic service providers wanted to treat less difficult malocclusions. This may indicate a future expansion in the amount and scope of orthodontic services provided in general dental practice. Similar findings were reported in America by Jacobs *et al.*[5] The expansion of orthodontic services in general dental practice has been associated with increased income derived from orthodontic service.[3,31] One of the questions in the attitude to orthodontic service provision scale asked the practitioner to indicate whether or not they believed providing orthodontic services was financially rewarding. Approximately 60% of the dentists surveyed stated that they believed orthodontic service provision was financially rewarding. There was a statistically significant difference between the provider and nonprovider groups ($P < 0.05$). Dentists in the provider group appeared more likely to believe that orthodontic service provision was financially rewarding. No previous study assessing dentists' orthodontic knowledge could be found. Consequently, comparison to other studies is not possible. The scale measuring dentists' orthodontic knowledge was significantly different between the provider and nonprovider groups. Dentists in the provider group had a better orthodontic knowledge. However, this variable was not significant in influencing the provision of orthodontic services or discriminating between providers and nonproviders, in the multivariate analyses. The mean number of hours worked per fortnight and the number of general practice patients seen in this study were comparable to the results from other studies.[32,33] Variables assessing practice productivity were significantly different between the provider and nonprovider groups. Dentists providing orthodontic services worked longer hours in general dental practice and saw more orthodontic patients than dentists in the nonprovider group. Orthodontic services, including referrals tospecialist orthodontists, accounted for 4.6% of orthodontic provider dentist's time and 0.8% of nonprovider dentist's time. In this study, a Student's *t*-test did not reveal a significant difference between the provider and nonprovider groups for the number of patients referred to a specialist orthodontists. This was in contrast to the results of Jacobs *et al.*[5] who found that dentists who provide more orthodontic services refer significantly fewer patients to orthodontic specialists.

Conclusion

Dentists in the nonprovider group, those who saw fewer than three orthodontic patients during the fortnight of the log, made up 64.5% of the sample. Dentists in the provider group, those who saw three or more patients, made up 35.5% of the sample. There were statistically significant differences between the provider and nonprovider groups. The practitioner characteristics that were significantly different between the two groups were in the areas of personal and practice characteristics as well as dentists' knowledge of and attitude toward orthodontics. The null hypothesis that selected characteristics of dentists providing orthodontic services were no different from those of dentists not providing orthodontic services was rejected. Two measures related to continuing education in orthodontics

were found to be significantly and positively correlated with the provision of orthodontic services. These were (1) orthodontic continuing education course attendance and (2) the frequency of use of various sources of information to keep up to date in orthodontics. This latter variable was also found to be significant in distinguishing providers from nonproviders of orthodontic services. General dental practitioners who perceived their patient base to consist of more adults saw significantly fewer orthodontic patients and were more likely to be classified as nonproviders than those general dental practitioners who perceived their patient base to contain more children. Other factors found to be significant in distinguishing providers of orthodontic services from nonproviders included not working in the city, working in the outer suburbs, not working for the government, a better attitude toward orthodontic service provision, orthodontics not being a regular part of the undergraduate course, not wanting to treat fewer orthodontic cases, a higher perceived orthodontic need of the dentists' patient base, and a higher referral level to specialist orthodontists.

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Conflicts of interest

There are no conflicts of interest.

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